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$z^3 < x^3 + y^3$ and $z^3 > z^3 - z^3$, and x , y , and z must be even numbers or two odd and the other even.

Ex. Put $x=9$, $y=7$, and $z=8$, the resulting numbers are, 280, 449, and 63.

Also solved by *P. S. BERG, M. A. GRUBER, ARTEMAS MARTIN, H. C. WHITAKER, and G. B. M. ZERR.*

8. Proposed by Hon. JOSIAH H. DRUMMOND, Portland, Maine.

Every odd square is of the form $4a+1$; find the value of a for the n th consecutive odd square.

Solution by *M. A. GRUBER, A. M., War Department, Washington, D. C., and R. H. YOUNG, West Sunbury, Pennsylvania.*

The consecutive odd squares are the squares of the consecutive odd numbers.

The difference between two consecutive odd numbers is 2.

Beginning with the odd number 1, the next odd number is 1×2 greater than 1; the 3d odd number is 2×2 greater than 1; the 4th odd number is 3×2 greater than 1, and so on to the n th odd number which is accordingly $n-1$ times 2 greater than 1.

The n th odd number is, therefore, $1+2n-2$, or $2n-1$.

$\therefore (2n-1)^2 = 4a+1$, and $a = n^2 - n = n(n-1)$.

Also solved by *A. H. BELL, C. W. M. BLACK, H. W. DRAUGHON, ARTEMAS MARTIN, P. H. PHILBRICK, H. C. WHITAKER, G. B. M. ZERR, and the PROPOSER*

AVERAGE AND PROBABILITY.

Conducted by *B. F. FINKEL*, Kidder, Missouri. All Contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

Proposed by Miss *LEOTA MILLER, B. L., Professor of Natural Science and Art, Kidder Institute, Kidder, Missouri.*

A deer, wounded at the corner of a square park, is equally liable to run in a straight line in any direction, from the corner of the park, and, at the same time, is also equally liable to drop dead before running a distance equal to the diagonal of the park. What is the chance that the deer will drop dead in the park?

II. Solution by *W. B. MILWARD, Amity, Missouri, and P. H. PHILBRICK, C. E., Lake Charles, Louisiana.*

Let $ABCD$ represent the park diameter a , and describe a circle with center A and radius $= a\sqrt{2} = AC$ the diagonal of the park. Area of park $= a^2$; area of circle $= \pi(a\sqrt{2})^2 = 2\pi a^2$. The area of the circle represents one half of all possible ground upon which the deer will fall. Hence the required probability is $\frac{a^2}{4\pi a^2} = \frac{1}{4\pi}$.

[REMARK:—Professor Philbrick writes, June 21: It [the problem above] is

misquoted in the May Number. The word "equally" before liable is omitted. Not noting that word probably accounts for the different solutions."

Professor Philbrick understands the problem to mean that the deer is just as liable to drop dead before running a distance equal to the diagonal of the park as it is to run a greater distance.

This is the meaning we get from the statement of the problem. Now the solutions printed in May No. assume that the deer actually drops dead within the circle whose radius is the diagonal of the square, while the above solution assumes that the probability that deer drops dead within this circle is $\frac{1}{2}$.

We take "equally liable" to mean that the chance of the deer's dying on running a distance equal to the diagonal of the park is equal to the chance of its not dying on running that distance, and since it must *live* or *die*, the chance for the one or the other is $\frac{1}{2}$. Hence, if the diagonal of the square is the limit of the deer's running before death ensues, the answer is $\frac{1}{2\pi}$; if the diagonal is not the limit, $\frac{1}{4\pi}$ is the answer. ED.]

4. Proposed by Professor G. B. M. ZERR, Principal of High School, Staunton, Virginia.

Four points taken at random in each half, made by the transverse axis, of an ellipse, are joined in such a way by straight lines as to inclose an octagonal surface; find the mean area of this surface.

Solution by the PROPOSER.

Let P, Q, R, S be four points in the semi-ellipse, axis a, b , above the transverse axis AA', D, E, F, G four points in the lower half. Through these draw $P'K, Q'N, R'T, S'B, D'L, E'M, F'H, G'C$ perpendicular to AA' . Let $\angle AOP' = \theta, \angle AOQ' = \phi, \angle AOR' = \psi, \angle AOS' = \rho, \angle AOD' = \mu, \angle AOE' = \nu, \angle AOF' = \omega, \angle AOG' = \lambda, KP = x, NQ = w, SB = z, DL = s, RT = y, ME = t, HF = u, CG = v$. Then we have $KP' = b \sin \theta = x', NQ' = b \sin \phi = w', TR' = b \sin \psi = y', BS' = b \sin \rho = z', LD' = b \sin \mu = s', ME' = b \sin \nu = t', HF' = b \sin \omega = u', CG' = b \sin \lambda = v'$. Area of the octagonal surface equals the area of the six triangles $RGS + RGF + FRQ + QFE + EQP + PED$.

$$\therefore A = \text{area} = \frac{1}{2}a \{ x'(\cos \phi - \cos \mu) + w'(\cos \psi - \cos \theta) + y'(\cos \rho - \cos \phi) + z'(\cos \lambda - \cos \psi) + s'(\cos \nu - \cos \theta) + t'(\cos \omega - \cos \mu) + u'(\cos \lambda - \cos \nu) + v'(\cos \rho - \cos \omega) \}.$$

An element of surface at P is $a \sin \theta d\theta dx$; at Q , $a \sin \phi d\phi dw$; at R , $a \sin \psi d\psi dy$; at S , $a \sin \rho d\rho dz$; at D , $a \sin \mu d\mu ds$; at E , $a \sin \nu d\nu dt$; at F , $a \sin \omega d\omega du$; at G , $a \sin \lambda d\lambda dv$.

The limits of θ and μ are 0 and π ; of ϕ , 0 and θ ; of ψ , 0 and ϕ ; of ρ , 0 and ψ ; of ν , 0 and μ ; of ω , 0 and ν ; of λ , 0 and ω . Hence, the required average area is,

$$A = \frac{\int_0^\pi \int_0^\pi \int_0^\phi \int_0^\theta \int_0^\psi \int_0^\rho \int_0^\nu \int_0^\omega \int_0^\mu \int_0^\lambda \int_0^x \int_0^w \int_0^y \int_0^z \int_0^s \int_0^t \int_0^u \int_0^v Aa \sin \theta d\theta a \times \sin \phi d\phi a \sin \psi d\psi a \sin \rho d\rho a \sin \mu d\mu a \sin \nu d\nu a \sin \omega d\omega a \sin \lambda d\lambda a dv dy dz ds dt du dw}{\int_0^\pi \int_0^\pi \int_0^\phi \int_0^\theta \int_0^\psi \int_0^\rho \int_0^\nu \int_0^\omega \int_0^\mu \int_0^\lambda \int_0^x \int_0^w \int_0^y \int_0^z \int_0^s \int_0^t \int_0^u \int_0^v a \sin \theta d\theta a \sin \phi d\phi a \times \sin \psi d\psi a \sin \rho d\rho a \sin \mu d\mu a \sin \nu d\nu a \sin \omega d\omega a \sin \lambda d\lambda a dv dy dz ds dt du dw}$$

